

CitA
BIM GATHERING



Building Capabilities in Complex Environments

CitA BIM Gathering 2017, Croke Park, November 23rd & 24th, 2017

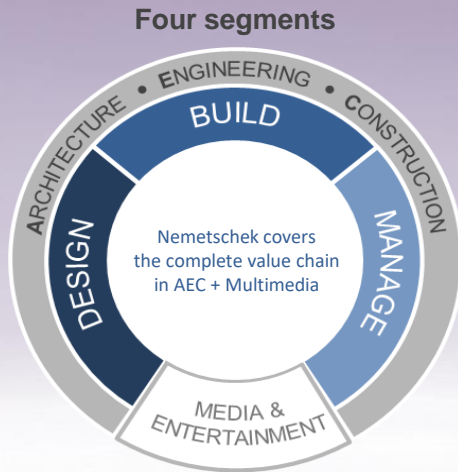


Data Quality Does It Matter To You?

Andrew Bellerby, Managing Director, Solibri UK Ltd



NEMETSCHKE
GROUP



Facts and figures

- > 50 years of innovation, founded in 1963 and headquartered in Munich, Germany
- Open BIM pioneer and 5D provider with software solutions for the AEC and media industry
- 14 strong brands
- 2.1 million users in 142 countries
- 1,800 employees worldwide
- > 50 locations in more than 40 countries
- 285.3 mEUR sales revenues (2015)
- IPO 1999, listed in the TecDax
- 2.0 billion EUR market capitalization



ALLPLAN

bluebeam

CREM SOLUTIONS

DATA DESIGN SYSTEM

dRofus

FRILO
Software

GRAPHISOFT

MAXON

NEVARIS

PRECAST SOFTWARE
engineering

IIRISA
A NEMETSCHKE COMPANY

SCiA

SDS/2
A NEMETSCHKE COMPANY

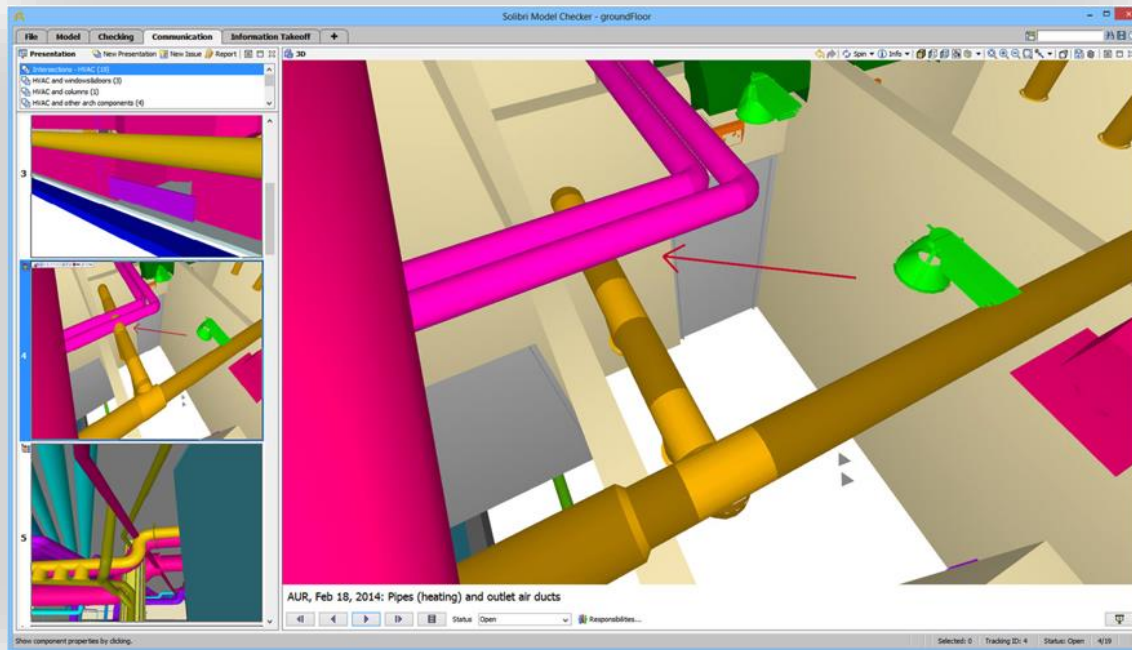
SOLIBRI
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VECTORWORKS





Is it Enough To Only Do Clash Detection ?

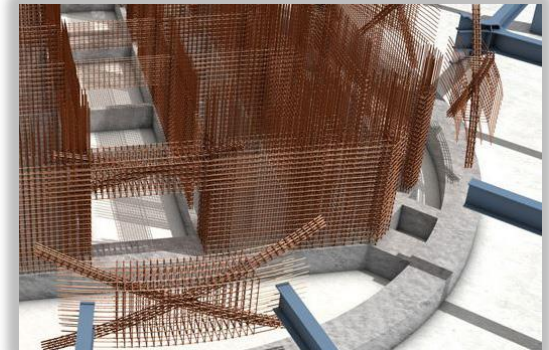
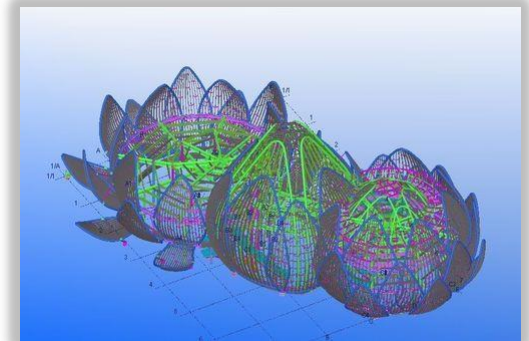


How do you Quality Assure your data as well as your geometry?
Is your model fit for purpose?



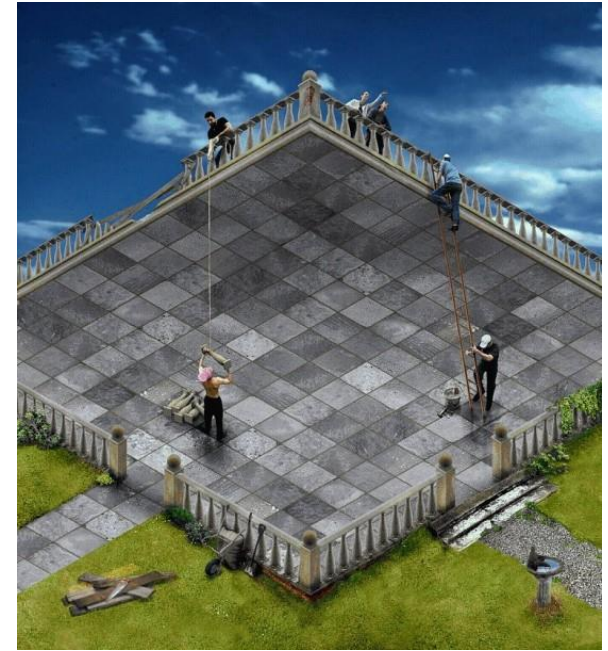
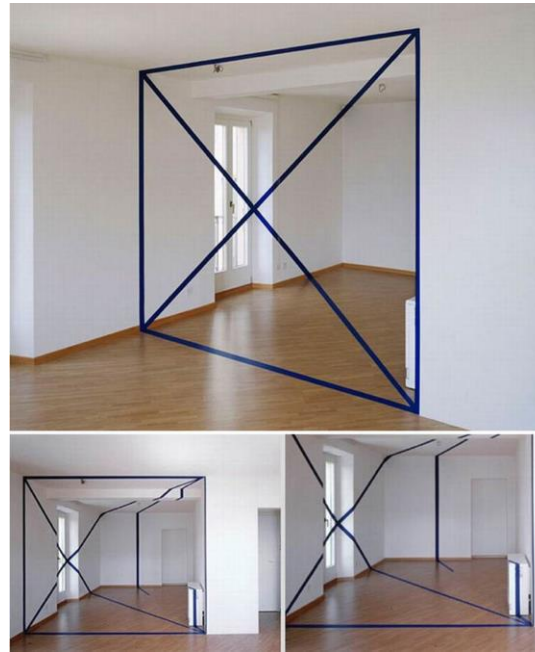
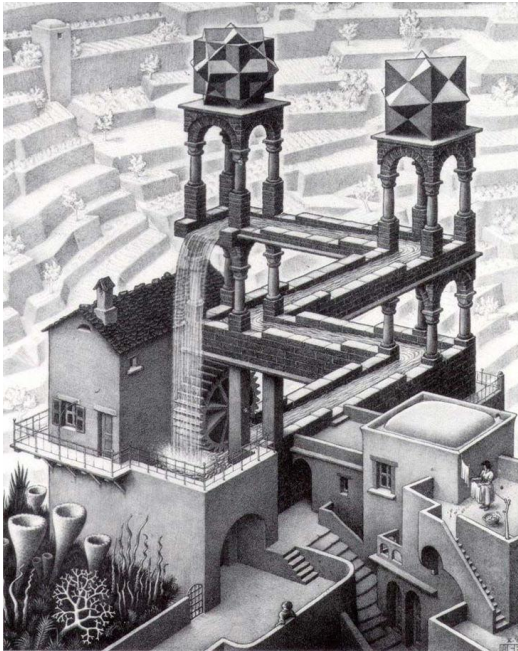


Fantastic Model Examples Everywhere





But Is Everything Quite What It Seems?



More or less every model we see has errors

People take shortcuts

Models often used primarily for drawings. As long as the drawing looks right ...

Its not my job



What Is In A Building Information Model?



A Collection of Data

- Geometric shapes
- Components
- Objects/Families
- Relationships
- Attributes
- Constraints
- Classifications
- Metadata
- Other

Which Must Conform To ...

- Standards (Industry, Company or Project)
- Different Protocols
- Regulations
- Best Practise



Data Quality Components



Timeliness – Is the data present when it is needed?

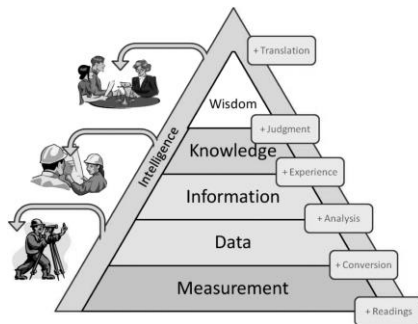
Completeness – Is all necessary data present?

Validity – Are the values used for the data acceptable?

Accuracy – Does the data describe the properties of the object correctly?

Consistency – Is data consistent between systems?
Do duplicate records exist?

Integrity – Is the relationship between data elements and data sets accurate?



What good is data if you don't know its accuracy completeness, or compliance with an established and agreed requirement?



From Modelling and Data



To INFORMATION utilization, exploitation and consumption.



Model Checking - Rulesets

WORKSPACE	
Name	
▼	<input type="checkbox"/> BIM Coordination
▼	<input type="checkbox"/> General
▼	<input type="checkbox"/> 1.0 File Name
§	1.1.0 File Name
▼	<input type="checkbox"/> 2.0 Datum Point
§	2.0.1. Model has a coordinate figure
§	2.0.1.1. Coordinates match BEP figure
§	2.0.2. Model has a rotation figure
§	2.0.2.1. Coordinate rotation match BEP figure
▼	<input type="checkbox"/> 3. Levels
§	3.1. Level Name
§	3.2. Building Levels
▼	<input type="checkbox"/> 4. Geometry
§	4.1. Architectural Duplicates
§	4.2. Structural Duplicates
§	4.3. MEP Duplicates
▼	<input type="checkbox"/> Model Coordination
▼	<input type="checkbox"/> 1. Architecture vs Structures
§	1.1. Architectural Models vs Structural Beams
§	1.2. Architectural Models vs Structural Columns
§	1.3. Architectural Models vs Structural Slabs
§	1.4. Architectural Models vs Structural Walls
§	1.5. Architectural Models vs Structural Other
§	1.6. Architectural Doors and Windows vs Structural Model
§	1.7. Architectural Models - Structural Models objects in front of doors and windows
▶	<input type="checkbox"/> 1.8. Architectural Models - Structural Models objects are the same size and in the same location

WORKSPACE	
Name	
▼	<input type="checkbox"/> 2. Architecture vs MEP
§	2.1. Architectural Slabs vs MEP Models
§	2.2. Architectural Walls vs MEP Models
§	2.3. Architectural Other vs MEP Models
§	2.4. Architectural Doors/Windows vs MEP Models
§	2.5. Architectural Interiors vs MEP Models
§	2.6. Architectural Models - MEP Models objects above ceilings
§	2.7. Architectural Models - MEP Models objects in front of doors and windows
▼	<input type="checkbox"/> 3. Structures vs MEP
§	3.1. Structural Beams vs MEP Models
§	3.2. Structural Columns vs MEP Models
§	3.3. Structural Slabs vs MEP Models
§	3.4. Structural Walls vs MEP Models
§	3.5. Structural Other vs MEP Models
▼	<input type="checkbox"/> 4. Landscape Architect
▼	<input type="checkbox"/> 4.1. Architecture vs Landscape Architect
§	4.1.1. Architectural Beams and Columns vs Landscape Architect Model
§	4.1.2. Architectural Doors and Windows vs Landscape Architect Model
§	4.1.3. Architectural Interiors vs Landscape Architect Model
§	4.1.4. Architectural Other vs Landscape Architect Model
▼	<input type="checkbox"/> 4.2. Structures vs Landscape Architect
§	4.2.1. Structures vs Landscape Architect
▼	<input type="checkbox"/> 4.3. MEP vs Landscape Architect
§	4.3.1. MEP vs Landscape Architect



A Few Examples of Quality Assurance and Control Checks



Who Benefits ?





Checking “Non Clashes”

INFO

Name: 2.7. Architectural Models - MEP Models objects in front of doors and windows

Description: [Edit](#)
This ruleset check that there are no components too close to doors and windows

Author: Solibri, Inc.

Version: 1.0

PARAMETERS Revert Changes ▲ Severity Parameters

Checked components + - 📁 📄 🗑️

State	Component	Property	Operator	Value
Include	Window			
Include	Door			

Free area width tolerance T: 50 mm

Free area depth limiter L: 50 mm

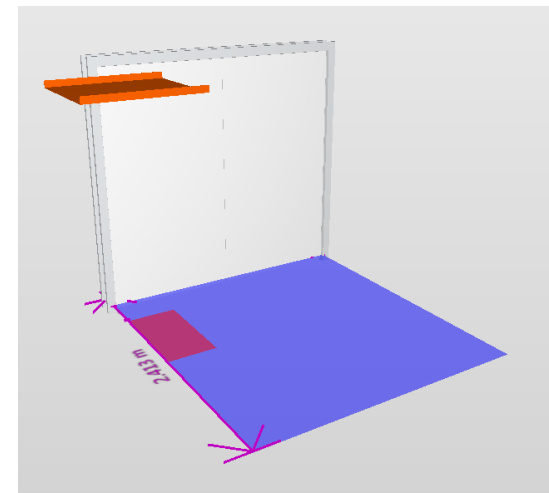
Use 'depth limiter L' as: Minimum area depth in front of component

depth = greater(W, L)

Components exceptionally allowed in free area + - 📁 📄 🗑️

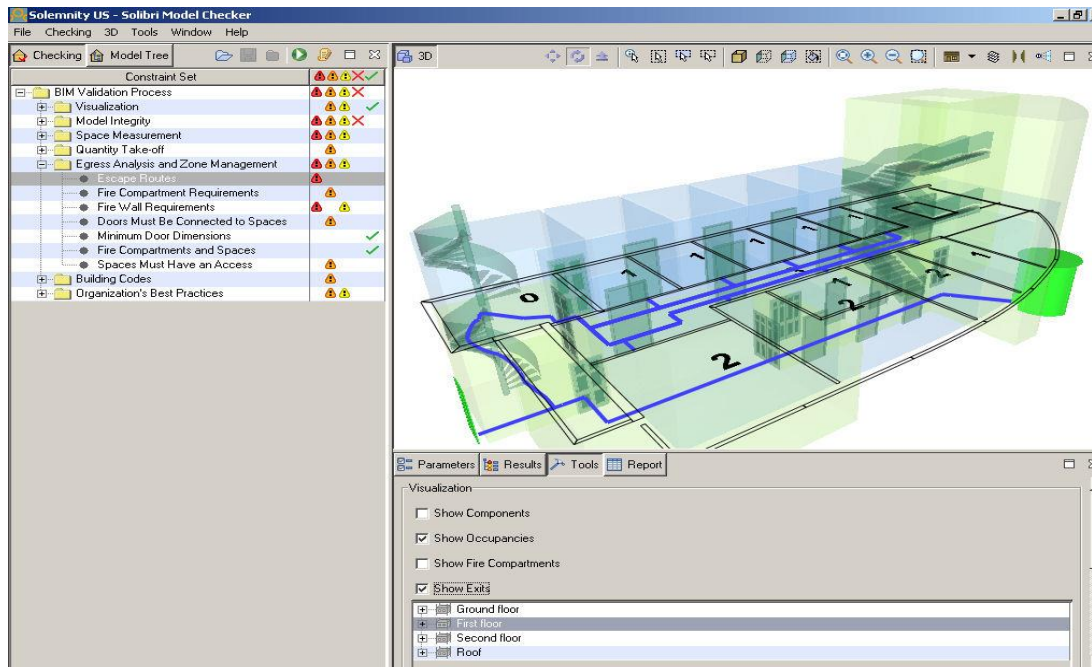
State	Component	Property	Operator	Value
Include	Any	Discipline	None Of	[Air Conditioning, Build...

A rule to check space in front of windows or doors that may impede on the view or opening of the window or door.





Egress and Occupancy



Perhaps the most sophisticated rule in Solibri's Model Checker using our spatial awareness for types of spaces and algorithms to calculate distances for escape routes to the nearest fire exit and then visually map them into the model and checking conformance against maximum permitted distance



Fire Zones

The screenshot shows the 'Solemnity US - Solibri Model Checker' interface. On the left is a 'Constraint Set' tree with various categories like 'BIM Validation Process', 'Egress Analysis and Zone Management', and 'Fire Compartment Requirements'. The central 3D view shows a pink building model with fire zones. At the bottom, the 'Info' panel displays a table of fire compartments.

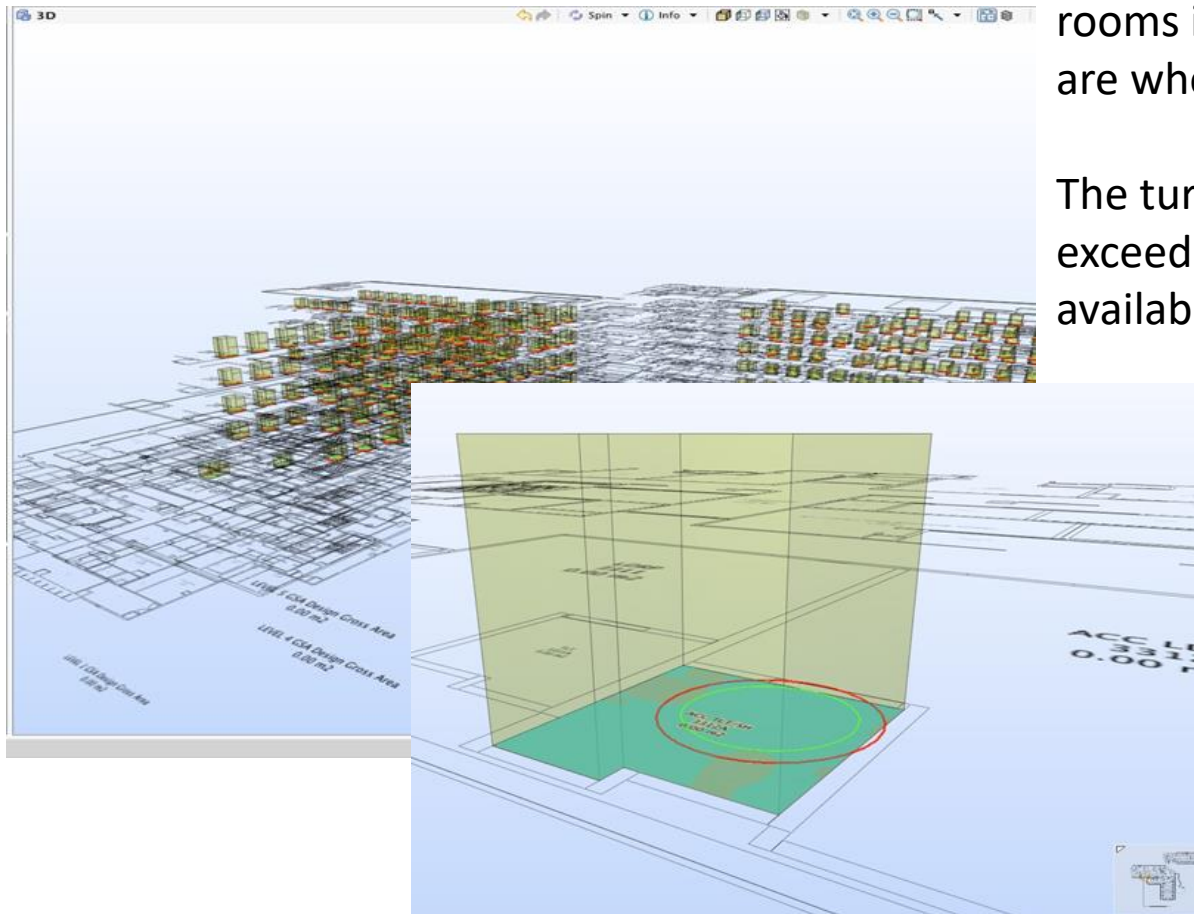
Compartment	Storey	Area
Gross Areas		
Fire Compartments		
Fire Compartment.0.1	Ground floor	85,852.6 sq in
Fire Compartment.0.2	Ground floor	182,325.3 sq in
Fire Compartment.1.1	First floor	86,178.9 sq in
Fire Compartment.1.2	First floor	204,776.3 sq in
Fire Compartment.2.1	Second floor	86,167.3 sq in
Fire Compartment.2.2	Second floor	204,793.2 sq in
Fire Compartment.3.1	Roof	18,212.6 sq in
Secure Compartments		

The second rule in the egress ruleset is checking fire zones and in this particular example we have a fire zone which has failed the check as it isn't a secured compartment

Other rules will check fire ratings on walls and also visually display that information



Checking Accessibility



This check has highlighted many rooms in a hospital where there are wheelchair access problems.

The turning circle required (in red) exceeds the maximum space available (in green).



Safety Checks

This rule will automatically check fall hazards and flag any gaps on the site where there are unprotected edges.

Checking

Ruleset:

- OSHA - 1926 - SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION
 - 1926 Subpart D - Occupational Health and Environment
 - 1926 Subpart F - Fire Protection and Prevention
 - 1926 Subpart M - Fall Protection
 - 1926.501 - Duty to have fall protection.
 - 1926.501(b)(1) - Unprotected sides and edges
 - 1926.501(b)(4) - "Holes."
 - 1926.502 - Fall protection systems criteria and practices
 - 1926 Subpart X - Ladders

Result Summary

Issue Count	S	I	W	C	P
Issue Density	0.25	0	0	5	0

Results

- Slabs of Type 7" max riser 11" tread Aren't Near Walls (2/2)
 - Slab.2
 - Slab.3
- Slabs of Type Generic - 12" Aren't Near Walls (2/2)
 - Slabs.3.1
 - Related Components
 - Slabs.2.1
 - Slabs of Type Non-Monolithic Landing Aren't Near Walls (1/1)
 - Slab.1

Info

Slab.3.1

Description: The slab footprint contains 5 sections that don't meet walls or other slabs. The total length of these sections is 99'-8 15/16".

Location: Level 7

Barrier Dimensions Allowed

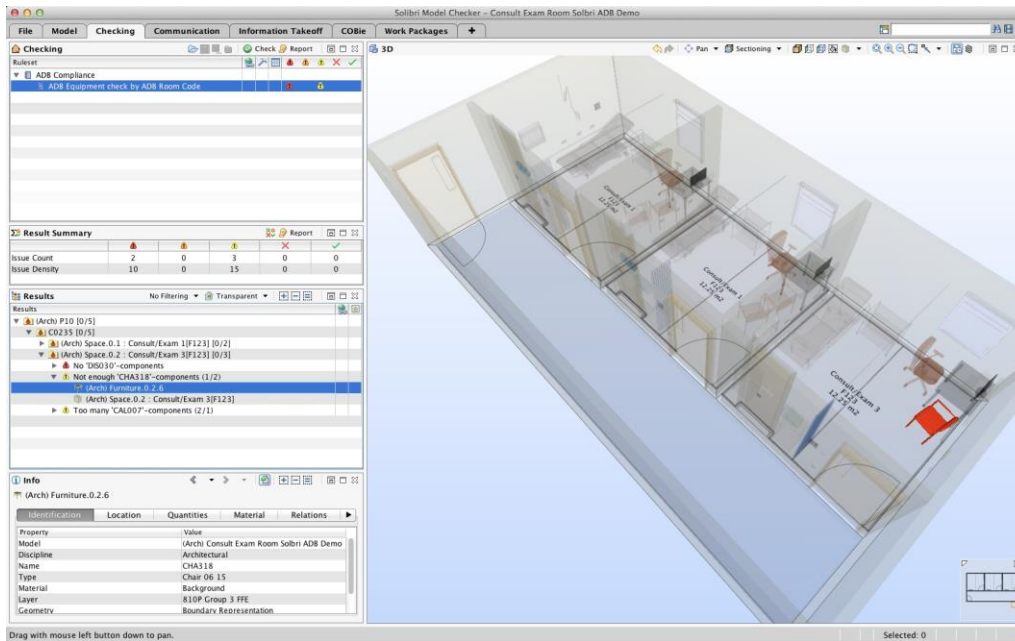
- Minimum Barrier Total Height: H_{min} 900 mm
- Maximum Horizontal or Vertical Gap between Barriers: G_{max} 900 mm
- Maximum Barrier Distance from Platform: B_{max} 100 mm

Landing Dimensions Allowed

- Max Distance to Landing: D_{max} 100 mm
- Maximum Fall: F_{max} 3.00 m
- Minimum Landing Width: W_{min} 200 mm



Missing Components



Solibri is also very good at checking for things that are missing. In this example, 3 consulting rooms in a hospital should all have the same standard equipment according to the room data sheets from the NHS. Because we know the type of space we can check all specified equipment is present against an external table Solibri has checked two of the consulting rooms and found they conform to the required specification but the third room has a patient chair missing.



Other Checks

Results No Filtering Automatic

Results

- Components Inside Each Other [0/1]
 - EW-1 240 (2) [0/1]
 - Wall.3.14 (EW-1 240) and Wall.3.7 (EW-1 240) are inside each oth
 - Wall.3.14
 - Wall.3.7

Info

Wall.3.14

BaseQuantities		Pset_WallCommon				
Hyperlinks	AC_Pset_Name	AC_Pset_RenovationAndPhasing				
Identification	Location	Quantities	Material	Profile	Relations	Classification
Property	Value					
Model	SMC Building					
Discipline	Architectural					
Name	Wall-105					
Type	EW-1 240					
Material	face brick 100 mm, Solid Fill 140 mm					
Layer	External walls					
Geometry	Extrusion					

Welcome to Solibri Model Checker

Overlapping Components

Info

Space.2.3 : Office[308]

Description Hyperlinks

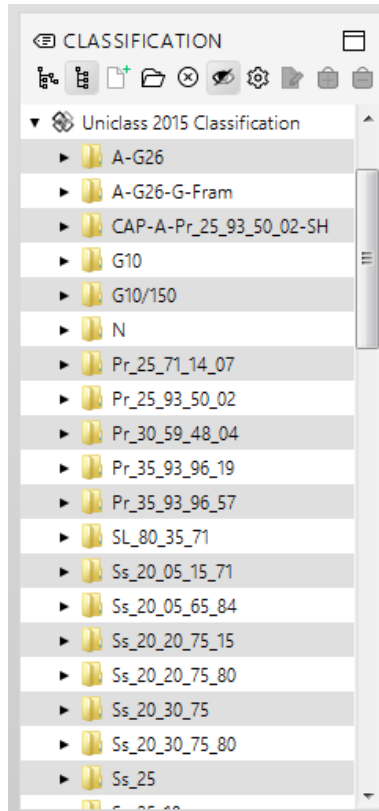
- Space perimeter is not totally aligned with bounding components. The total length of these segments is 829 mm.

Space Validation

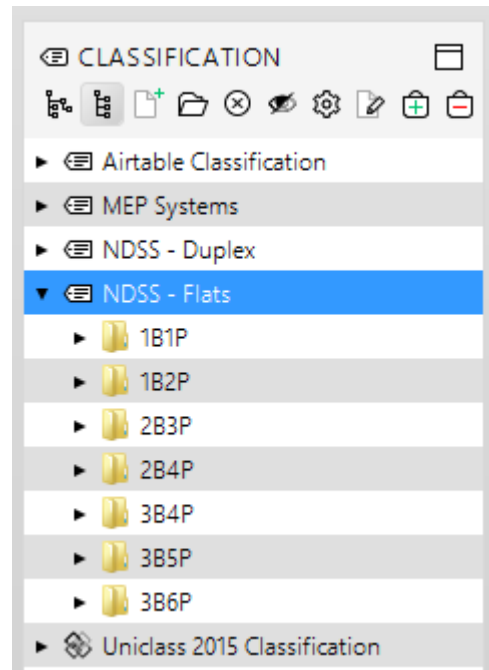


Classifications

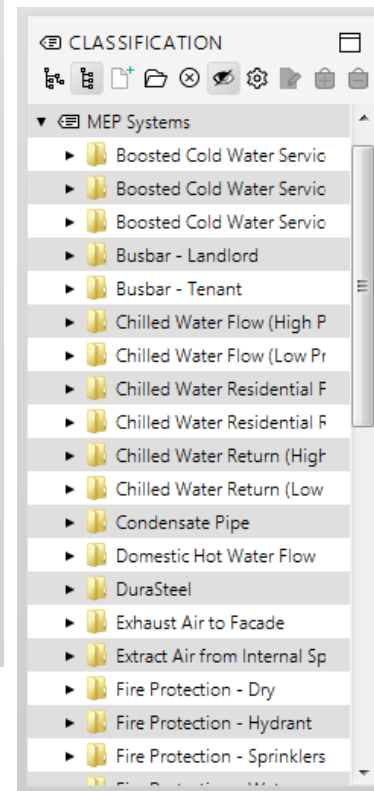
Classifications in Solibri are a way of filtering the model and visualising data and when combined with our Information Take Off functionality it provides a powerful tool



Uniclass 2015



NDSS



MEP Systems



Information Take Off

Floor	Space Usage	Total Area	Average Area	Count	Color
(ARCH) Story-1	Bathroom	55.0 m2	4.6 m2	12	Yellow
(ARCH) Story-1	Circulation	158.8 m2	19.8 m2	8	Orange
(ARCH) Story-1	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-1	Kitchen	36.0 m2	9.0 m2	4	Pink
(ARCH) Story-1	Residence	570.0 m2	28.5 m2	20	Light Blue
(ARCH) Story-1	Special	2,824.0 m2	88.3 m2	32	Light Green
(ARCH) Story-1	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-1	Technical	35.0 m2	11.7 m2	3	Light Yellow
(ARCH) Story-2	Bathroom	55.0 m2	4.6 m2	12	Yellow
(ARCH) Story-2	Circulation	158.8 m2	19.8 m2	8	Orange
(ARCH) Story-2	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-2	Kitchen	36.0 m2	9.0 m2	4	Pink
(ARCH) Story-2	Residence	570.0 m2	28.5 m2	20	Light Blue
(ARCH) Story-2	Special	2,824.0 m2	88.3 m2	32	Light Green
(ARCH) Story-2	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-2	Technical	35.0 m2	11.7 m2	3	Light Yellow
(ARCH) Story-3	Bathroom	55.0 m2	4.6 m2	12	Yellow
(ARCH) Story-3	Circulation	158.8 m2	19.8 m2	8	Orange
(ARCH) Story-3	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-3	Kitchen	36.0 m2	9.0 m2	4	Pink
(ARCH) Story-3	Residence	570.0 m2	28.5 m2	20	Light Blue
(ARCH) Story-3	Special	3,024.0 m2	8.7 m2	1	Light Purple
(ARCH) Story-3	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-3	Technical	35.0 m2	11.7 m2	3	Light Yellow
(ARCH) Story-4	Bathroom	55.0 m2	4.6 m2	12	Yellow
(ARCH) Story-4	Circulation	158.8 m2	19.8 m2	8	Orange
(ARCH) Story-4	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-4	Kitchen	36.0 m2	9.0 m2	4	Pink
(ARCH) Story-4	Residence	570.0 m2	28.5 m2	20	Light Blue
(ARCH) Story-4	Special	2,824.0 m2	88.3 m2	32	Light Green
(ARCH) Story-4	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-4	Technical	35.0 m2	11.7 m2	3	Light Yellow
(ARCH) Story-5	Circulation	73.8 m2	73.8 m2	1	Light Purple
(ARCH) Story-5	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-5	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-5	Technical	35.0 m2	11.7 m2	3	Light Yellow
(ARCH) Story-6	Circulation	73.8 m2	73.8 m2	1	Light Purple
(ARCH) Story-6	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-6	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-6	Technical	35.0 m2	11.7 m2	3	Light Yellow
(ARCH) Story-7	Bathroom	55.0 m2	4.6 m2	12	Yellow
(ARCH) Story-7	Circulation	158.8 m2	19.8 m2	8	Orange
(ARCH) Story-7	Elevator	12.5 m2	4.2 m2	3	Red
(ARCH) Story-7	Kitchen	36.0 m2	9.0 m2	4	Pink
(ARCH) Story-7	Residence	570.0 m2	28.5 m2	20	Light Blue
(ARCH) Story-7	Special	24.0 m2	24.0 m2	1	Light Purple
(ARCH) Story-7	Storage	8.7 m2	8.7 m2	1	Light Purple
(ARCH) Story-7	Technical	35.0 m2	11.7 m2	3	Light Yellow

Concrete Volumes
By Grade
By Type
Etc

Component	Type	Volume	Count	Color
Curtain Wall	Curtain Wall_PIL_CONTIGUOUS PILE-750DIA...	442.155 m3	3	Yellow
Slab	1200DIA_PILE_RBG	100.935 m3	15	Orange
Slab	1500 THK PILECAP	33.600 m3	1	Pink
Slab	900DIA_PILE_RBG	176.981 m3	47	Light Blue
Slab	CAP-PC-PILE CAP_resi-retail_RBG1-CAP-PC...	389.111 m3	1	Light Green
Slab	CAP-PC-PILE CAP_resi-retail_RBG-CAP-PC...	1,184.494 m3	3	Light Purple
Slab	CAP-PC1 PILE CAP_RBG	541.795 m3	10	Light Yellow
Slab	CAP-PC10 PILE CAP_RBG	29.743 m3	1	Yellow
Slab	CAP-PC11 PILE CAP_RBG	33.650 m3	1	Orange
Slab	CAP-PC12 PILE CAP_RBG	27.627 m3	1	Pink
Slab	CAP-PC13 PILE CAP_RBG 2	34.077 m3	1	Light Blue

Space Usage
Room Type and Count
Floor Area
Volume



Information Take Off - COBie

The screenshot shows the Solibri Model Checker interface. The top menu includes File, Model, Checking, Presentation, Information Takeoff, and COBie. The main window displays a 3D perspective view of a building interior with various elements like walls, doors, and windows. On the left, there is a Model Tree and an Info panel for 'Window.1.8' showing properties like Area (1.65 m2) and Height (2.20 m). At the bottom, a COBie table is visible with columns A through Q. The table contains data for various building components such as Floor Deck, Roof, Single - Flush, Single - Glass, Skylight, and Sofa.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
133	Floor Deck	n/a	n/a	Wood Floor Window	R103	Floor Deck	n/a	Window	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	11.68
134	Floor Deck	n/a	n/a	Floor Deck	n/a	Floor Deck	n/a	Slab	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	59.23
135	Floor Deck	n/a	n/a	Floor Deck	n/a	Floor Deck	n/a	Slab	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	59.33
136	Floor Deck	n/a	n/a	Structural Floor Deck	n/a	Floor Deck	n/a	Slab	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	25.42
137	Floor Deck	n/a	n/a	Floor Deck	n/a	Floor Deck	n/a	Slab	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	25.42
138	Floor Deck	n/a	n/a	Structural Floor Deck	n/a	Floor Deck	n/a	Slab	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	64.78
139	Floor Deck	n/a	n/a	Structural Floor Deck	n/a	Floor Deck	n/a	Slab	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	64.91
140	Roof	n/a	n/a	Structural Roof Deck	R101	Roof	n/a	Roof	1103SUNFD	Available	n/a	n/a	n/a	Available	n/a	132.54
141	Single - Flush	n/a	n/a	Flush Wood Door	R101	Single - Flush	n/a	Door	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	2.93
142	Single - Flush	n/a	n/a	Flush Wood Door	R101	Single - Flush	n/a	Door	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	2.93
143	Single - Glass	n/a	n/a	Wood Door	R102	Single - Glass	n/a	Door	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	2.41
144	Single - Glass	n/a	n/a	Wood Door	R102	Single - Glass	n/a	Door	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	2.41
145	Skylight	n/a	n/a	Roof Window	R101	Skylight	n/a	Window	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	0.76
146	Skylight	n/a	n/a	Roof Window	R101	Skylight	n/a	Window	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	0.76
147	Sofa	n/a	n/a	1183mm	R102	Sofa	n/a	Furniture	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	n/a
148	Sofa	n/a	n/a	1183mm	R102	Sofa	n/a	Furniture	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	n/a
149	Sofa	n/a	n/a	1183mm	R102	Sofa	n/a	Furniture	1103SUNFD	Available	n/a	2012	n/a	Available	n/a	n/a

Is it enough to generate COBie deliverables without first of all validating the content?

Visual COBie data allows bi-directional querying and interrogation



In Summary - Data Quality Does It Matter To You?

One thing is abundantly clear, now data is becoming more prevalent in models there is a very real requirement to manage that data.

However, if it has not been verified and validated then have you the confidence to use it?

What good is data if you don't know its accuracy, completeness, or compliance with an established standard?

Data used without validation is an educated guess

Bad data will result in inaccuracies later in the project (estimating, procurement, calculations, delays, site changes etc)

It will directly impact your bottom line!



But is data quality really that important?



Source: Gartner, Measuring the Business Value of Data Quality Published: 10 October 2011

Cita
BIM GATHERING



Andrew Bellerby

THANK YOU
